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Design Proposal for Passengers and Goods Boat Terminal NDI-IBE Water Course, AFIKPO-EBONYI State

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ABSTRACT: Nigeria has over 10,000 kilometers of water ways, this water resources comprises rivers, lakes, creeks, lagoons and lakes and intra-coastal water. Afikpo is an eastern Igbo town of over 800,000 persons nestling on the west bank of cross-river just after the point where the river turns from a southwesterly to a southerly course. This water course which also substitutes as boundary between Cross-River and Ebonyi states has made it possible for both passengers and goods to move from Ebonyi state to Cross-River and vice-versa. Unfortunately, Afikpo has no ferry terminal to carter for the teeming passengers and goods which arrive daily and particularly on Orie Market days (one of the four market day's native to the igbos). This study reviewed the design, construction and operation of a well-planned ferry terminal footprint that optimizes passenger comfort, satisfaction and safety. This study adopts a case study approach and interview in appraising two (2) ferry terminals. The case study involved observation, and interviews were carried out on the facility operators and passenger for each of terminals studied. On the spot interview was also conducted on passengers and facility operators of the proposed passenger and ferry terminal in Ndi Ibe. Finding reveals a general poor design as existing terminals failed to take into cognizance the immediate space needs of local and frequent users for satisfaction, comfort and safety for both able bodied or mobility impaired. The research concludes that design approach to a ferry building or boat terminals most be done by applying basic design principles that will meet the immediate needs of users by providing the much needed comfort, satisfaction and safety.
KEYWORDS: boat Terminal, design, comfort, safety, passengers.

I.INTRODUCTION

Inland waterways are made up of navigable rivers, lakes, creeks, lagoons and canals (Aderemo & Mogaji, 2010.).Transportation of goods and services through water ways is one of the foremost modes of transportation. This is largely due to the fact that inland water transportation offers the most economical, energy efficient and environmentally friendly means of transporting all cargo from place to place (Ojile, 2006),it also offers safe and cheaper transportation in areas with water courses (Nsan-Awaji, 2019). Water transportation is as old as human civilization itself, it is therefore very difficult to say exactly when water transportation began. According to the Encyclopedia Britannica the Egyptians (who are also the custodians of the cradle of civilization) were probably the first to use seagoing vessels. The Egyptians, for all their wisdom, did not know how to harness and draft horses, and, until 1600 BC, were without wheeled vehicles. Land transport was slow and costly. The Nile however, was a natural highway, which united the long valley. Boats provided the Egyptians with their only means of long-distance transport for the great masses of granite and basalt needed to build their pyramids and temples. Along the Nile, too, came supplies of corn for the cities (Zuofa, 2005) The Phoenicians, Greeks, and Romans also relied on waterways to move passengers and goods. As early as 4th century B.C.E the Chinese relied solely on internal water-ways to transport food and passengers to very large cities, they achieved these with ships equipped with multiply mast and rudders.

Terminals are transportation centers where goods and people are transferred onto and off vehicles. Terminals include ports, airports, bus stations, and train stations. Terminal is defined as the end of a carrier line (such as a railroad, trucking, shipping line or airline, with accompanying dockyard facilities, management office, and storage shades freights and stations (Gove, 1976.) It goes further to define it differently as a freight or passenger stations that is central to a considerable area or serves as a junction at any point with other lines, and as a town or city at the end of a carrier line.

A boat is a vessel for transport by water, constructed to provide buoyancy by excluding water and shaped to give stability and permit propulsion, a small ship. The Cambridge dictionary defines a boat as a small vehicle for travelling on water. Traditionally, boats were distinguished from ships by size—any vessel small enough to be carried aboard a

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

ship was considered a boat. Today, the boundary between boats and ships is no longer defined with precision. Some larger vessels are called boats, although they are longer than some ships.

Boat terminal therefore, can be defined as a place where small water- bound passenger vessels and freight are travelling or carried by boat across a body of water and which has dockyard and other ancillary facilities. (Nekabari, 2010) (Dagoga & Tamunoiminabo, 2021)

In Nigeria, according to the National inland water ways, 28 of the 36 states of the federation can be linked by water, though only about 30 percent of these vast resources, which is about 3800 kilometers of water, are navigable. Areas adjacent to the navigable rivers represent the nations' most important agricultural and mining regions (Ezenwaji, 2010.). IWT in Nigeria is "untapped goldmine for investors" and studies have shown that it facilitates commerce, promote wealth creation, poverty alleviation and create jobs opportunities for the youths especially for those within such areas.

Inland water ways in Nigeria is faced with numerous problems one of which is the lack of basic building infrastructure-Terminals and also the neglect in terms of renovation of existing terminals, poor design of existing building infrastructure along water courses, lack of funding for the proper maintenance of existing terminals, failure in the erection of new terminals thereby overstretching and creating pressure on existing ones .These challenges has affected the operation of IWT in Nigeria. Obed, (2013) opines that there has been a considerable decline in the use of IWT in Nigeria. This was attributed to several physical constraints impending growth and performance in the IWT sector in Nigeria, the Afikpo chronicle is no exception. These challenges has necessitated this study which attempts to provide a blueprint for the design, construction and operation of a ferry terminal which in turn can radically improve the sector so that it continues to remain the bedrock of trade, industrial and economic growth.

s/no.	Category of goods	Examples	Direction of Movement.
1.	Agricultural products	Yam, Maize, vegetables. etc.	Either form farms or to the markets
2.	Plant resources	Firewood, leaves, roots, fruits, timber etc.	Either from forests/bushes or to the market
3.	Manufactured Goods	Plastic, Drinks, books, clothes, cement, Iron etc.	Either from markets to markets or from markets to home
4.	Cultural Items	Musical and religious Implements	Either from markets to markets or from markets to home
5.	Harvest Fish	Fishes caught along the rivers by fishermen	Either from river to home or from home to markets
6.	Raw Materials	Palm oil, kernel, water etc.	Either to factories or to markets
7.	Tools	Farming tools and tools for building canoes etc.	Either to homes, farms, forests or markets.
8.	Oil and gas Products	Fuel, kerosene etc.	Either to or from the markets
9	Building materials	Sand, gravel, stores	Either to homes or factories
10	Machinery and equipment.	Water, utensils,	Either from factories, ports, or to industries, markets etc.

Table 1: Goods transported along the Nigerian Inland water ways (Obeta, 2014)

A.Review of studies on the design of boat terminals

Works and research exist on boat and ferry terminal design in different location but very few have actually been published and no two selected sites for design are exactly the same. One of the works which stands out is the works of Olatunde,

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

Eke, Opoko, Izobo- Martins, Ediae, & Akinola, (2020.) which examined design compliance and accessibility where the noted that the application of universal design and accessibilty in transport terminals avail tremendious benefits to all travellers including people with disability and the aged, case studies of this work was carried out in Lagos, Nigeria involving three terminals.

There are also other also other research works that have been carried out on various aspects of water transportation in Nigeria with no focus on the design and construction of the building fabric like the pioneering works of Udo, (1970), Adetola, (1971), Abams, (1998, 1999,2004) there focus was mainly on origin,advantages of inland water transportation, neglect, management, problems, potentials of inland water transportation. There are also several unpublished thesis on boat and ferry terminal design one of which is by Nekabari, (2010) which delved into the study of boat terminal design with biase on effective circulation, he opined that terminals which have well planned and fuctional pedestrains network are typically more liveable and convenience for pedestrains. He further stated that a well-planned pedestrian circulation system can also provide a Terminal with safe areas for individuals to walk and bike. Such a system can, furthermore, promote a healthy interaction between different types of land uses, build a more complete sense of neighborhood, and provide for a greater appreciation of the natural beauty of the area.

Other works include the Ijede ferry terminal design by Okolie, (2015), which aimed to design a potentially Viable public space by creating an architectural language that works with existing site conditions with the aim to restore, Evolve, Reconnect and revitalize the ferry terminal area. Works of Eke, (2018) also applied universal design principles to ensure the proposed terminal is accessible to all categories of users without descrimination to age, ability or disability. The study hinged on relevant literature to examine the current approaches to planning and design of ferry Terminal.

From the above review, it is very obvious that the design of a boat terminal are clearly centered on users and usability, and if these facilities are to serve their purpose of not only providing a comfortable and safety space, but also contribute to the socio-economic growth within the environment which they are sited they must be properly designed to meet the immediate needs of the users.

B.General planning principle and design consideration

The planning and design of the terminal are controlled by the mode of service provided. The general flowchart for a passenger-only ferry terminal is shown in the Figure below. The departing passenger can access the terminal by various means, including walking (or bicycling), transit (all forms), park-and-ride, taxi, and kiss-and-ride. (Habib & Roess., 1979) .The departing passenger is processed (if necessary) through turnstiles to a holding area. Depending on the demand at the terminal and climatic conditions, the holding area may be an enclosed structure. When a ferry arrives, arriving passengers disembark first, after which departing passengers are loaded onto the ferry. For most passenger-only operations, the arriving passenger flows have complete physical and temporal separation from the departing flows for control and ease of movements. The departing passengers leave the terminal by various means. When the terminal is in (or near) the downtown, the predominant mode is walk or transit. Data can also be collected for transportation route location which would allow for careful preparation of approaches, exits, and facility location. The terminal's facilities, as well as the type and amount of traffic (pedestrian, vehicles and goods).This may aid in determining the scale, structure, and form of facilities expected in the terminal, as well as the organization of terminal spaces, the design of ferry/boat activities, and the nature of the site. With this in mind, such services must be available in order for the water transport terminal to operate properly (Dagoga & Tamunoiminabo, 2021). They could serve all terminal customers, including passengers and tourist or staff, and could be classified as follows:

- Tourist/ passengers facilities
- Staff facilities
- Administration
- Service and maintenance facilities
- Anciliary facilities

ISSN: 2350-0328
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Vol. 11, Issue 6, June 2024

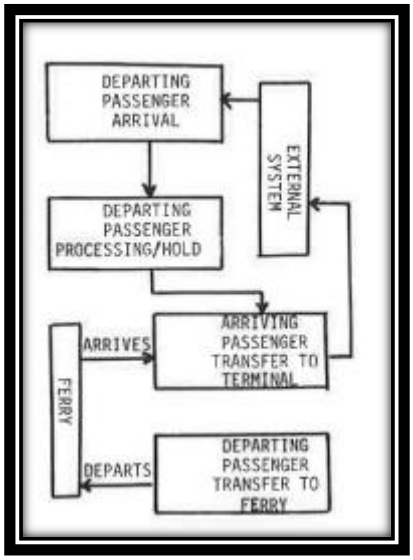

Figure 1: Flow chart for passengers-Only Terminal (Habib & Roess., 1979)

It is also important to note that the basic design consideration which enhances spaces for users in water transportation is a combination of outdoor and indoor facilities (Department of Transport, 2010) Outdoor facilities for consideration include: quality of the pavement and road surface, provision of curb ramps sloped to provide easy access for wheelchair users and wheeled luggage, parking facilities and drop-off zones, shelter from weather elements, adequate lighting, security, use of floor markings and signage, seat provision, information delivery through a variety of formats (visual, audible, tactile), embarking and disembarking the vessels, general maintenance and cleaning. Indoor facilities for consideration in accessibility includes: access to and approach of the building; internal movement and spatial transition between levels, using elevators or escalators, footbridges and steps; ticketing points and machines; information points, refreshment and seating areas, luggage lockers and toilets and signage . Detailed guide on how each of these considerations for accessibility in Ferry Terminals can be achieved are available in various codes for accessibility and universal design; with walkways, halls, paths, serving as access routes should be free of obstructions or protruding objects (Canadian Transport Agengy, 2007, building Construction Authority., 2006, United States Access Board., 2018)

C.Methodology

This study involves carrying out field investigations of existing situations to determine the shortfall in cases studied and solve the problems identified in the study. Two(2) local and one foreign existing situation were analysed. Interviews were carried out in the location of the proposed Ndi- ibe beach terminal. Details of the construction of the foreign case study were included to provide one with the basic knowledge of boat terminals in term of the architectural character, form, space articulation for comfort and pedestrains circulation for safety. Primary and secondary data were obtained and used. Data collection for each terminal were carried out by HNDII students of the department of Architectural Technology, Akanu Ibiam Federal Polytechnic Unwana in a studio integrated design approach (SIDA). The entire field work was conducted between 15th febuary 2022 and 22nd March 2022. Secondary data used includes information from books, Journals, Monographs, maps and information from internet. The data were analysed using various simple statistical techniques such as totals, means, percentages e.t.c.

III. RESULTS AND DISCUSSION (EXISTING SITUATION OR CASE STUDIES)

A.Case study One, *Ndi Ibe Terminal.*

This case study was basically carried out to ascertain the activities in this area in terms of number of passengers,navigational routes,number of motorized boats e.t.c. field investigation revealed that there was no purpose built or make- shift structure used as a terminal,which has necessitated this proposal. Generally, activities include the arrival and departure of passengers travelling to and from different destinations, arrival and docking of boats to and from different destination, arrival and offloading of goods (these goods are usually farm produce like plantain in bunches or garri in bags, timber from Ekoro Onah, Ogada and Cameroun respectively e.t.c). Most times these farm produce are sold just as they arrive at the bank of the water course. Logs of timber cut to size which are ferried from Cameroun are usually littered around the water water bank once offloaded and may remain there indefinitely till properly cleared by the owner.motorcyles and cars which drop off passengers intending to travel to different destinations are usually parked by

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

the sides of the road or at the end point of the road without a defined space mapped out for them. Passengers waiting to embark also do not have defined where space where they stay and wait. These activities are shown in the plates below;

Plate 1: showing wooden canoes docked at bank of water course (Author's field work)

Plate 2: showing arrival of timber and plantain from various towns (Author's field work)

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

Plate 3: timber cut to size offloaded by the road side without a defined space. (Author's field work)

s/no.	Study Area.	Navigable Routes.	Market Days	Mean weekly volume of passengers.	Mean weekly no. of trips.	Percentage (%)	Mean weekly No of observed motorized Canoes
1.	Ndi Ibe.	Ekoro okpara	Orie	547	4	13.3	22
2.	Ndi Ibe.	Ekoro Onah.	Orie	463	3	11.3	19
3.	Ndi Ibe	Ogbem.	Orie, Afor.	604	4	14.7	25
4.	Ndi Ibe.	Ogada.	Orie.	478	3	11.7	19
5.	Ndi Ibe	Igbom.	Nkwo	542	4	13.2	23
6.	Ndi Ibe.	Omkum.	Nkwo.	537	4	13.1	22
7.	Ndi Ibe.	Uzom Otom	Eke.	402	3	9.8	16
8.	Ndi Ibe.	Ebiji Akara	Eke.	529	3.	12.9	22
			Total	4,102	28	100	168

Table 2: showing Mean weekly volume of passengers, trips etc. Source: (Author's field work.)

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	7	210	10	300	17	510
2.	8am-10am.	4	120	5	170	9	290
3.	10am-12am.	1	40	1	40	2	80
4.	12pm-2pm.	2	70	1	40	3	110
5.	2pm-4pm.	1	30	2	60	3	90
6.	4pm-6pm.	2	60	2	60	4	120
	Total	17	530	21	670		

Table 3: Time distribution of passengers and boat for arrival and departure for Ekoro Okpara
Source: (Author's field work)

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	-	-	6	180	6	180
2.	8am-10am.	-	-	4	120	4	120
3.	10am-12am.	1	30	1	30	2	60
4.	12pm-2pm.	1	30	1	30	2	60
5.	2pm-4pm.	1	30	5	150	6	180
6.	4pm-6pm.	1	30	2	60	3	90
	Total	4	120	19	570		

Table 4: Time distribution of passengers and boat for arrival and departure for Ekoro Onah
Source: (Author's field work)

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	9	270	9	270	18	540
2.	8am-10am.	3	120	5	170	8	290
3.	10am-12am.	2	60	1	30	3	90
4.	12pm-2pm.	2	60	1	30	3	90
5.	2pm-4pm.	1	30	2	60	3	90
6.	4pm-6pm.	2	60	2	60	4	120
	Total	19	600	20	620		

Table 5: Time distribution of passengers and boat for arrival and departure for Ogbem
Source: (Author's field work)

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	6	180	4	120	10	300
2.	8am-10am.	2	70	5	150	7	220
3.	10am-12am.	-	-	1	30	1	30
4.	12pm-2pm.	1	30	1	30	2	60
5.	2pm-4pm.	2	60	2	60	4	120
6.	4pm-6pm.	2	60	-	-	2	60
	Total	13	400	13	390		

Table 6: Time distribution of passengers and boat for arrival and departure for Ogada
Source: (Author's field work)

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	-	-	7	210	7	210
2.	8am-10am.	-	-	4	120	4	120
3.	10am-12am.	-	-	1	30	1	30
4.	12pm-2pm.	1	30	1	30	2	60
5.	2pm-4pm.	1	30	5	150	6	180
6.	4pm-6pm.	-	-	3	90	3	90
	Total	2	60	21	630		

Table 7: Time distribution of passengers and boat for arrival and departure for Igbom
Source: (Author's field work)

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	-	-	5	150	5	150
2.	8am-10am.	-	-	3	90	3	90
3.	10am-12am.	-	-	1	30	1	30
4.	12pm-2pm.	1	30	1	30	2	60
5.	2pm-4pm.	1	30	5	150	6	180
6.	4pm-6pm.	-	-	3	90	3	90
	Total	2	60	18	540		

Table 8: Time distribution of passengers and boat for arrival and departure for Omkum
Source: (Author's field work)

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	6	180	1	30	7	210
2.	8am-10am.	3	90	1	30	4	120
3.	10am-12am.	2	60	1	30	3	90
4.	12pm-2pm.	2	60	1	30	3	90
5.	2pm-4pm.	-	-	7	210	7	210
6.	4pm-6pm.	-	-	2	60	2	60
	Total	13	390	13	390		

Table 9: Time distribution of passengers and boat for arrival and departure for Uzom Otom
Source: (Author's field work)

s/ no	Time (Hrs)	Mean daily No. of motorized Boats (Arrival)	Mean daily No. of Passengers (Arrival)	Mean daily No. of Motorized boats (Departure)	Mean daily No. of passengers (Departure)	Total	
						boats	Passengers
1.	6am-8am.	8	240	-	-	8	240
2.	8am-10am.	2	60	-	-	2	60
3.	10am-12am.	3	90	1	30	4	120
4.	12pm-2pm.	3	90	2	60	5	150
5.	2pm-4pm.	1	30	9	270	10	300
6.	4pm-6pm.	-	-	4	120	4	120
	Total	17	510	16	480		

Table 10: Time distribution of passengers and boat for arrival and departure for Ebiji Akara
Source: (Author's field work)

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

s/no.	Study Area.	Departure point.	Market Days	Goods Transported.
1.	Ndi Ibe.	Ekoro okpara	Orie	Agricultural products e.g.Plantain,Vegetables,Maize
2.	Ndi Ibe.	Ekoro Onah.	Orie.	Agricultural products and plant resources e.g. plantain fruits, leaves etc.
3.	Ndi Ibe	Ogbem.	Orie, Afor.	Agricultural Resources and Raw materials e.g. Plantain, fruits palm Kernel
4.	Ndi Ibe.	Ogada.	Orie.	Agricultural products e.g. yam ,cassava and manufactured products e.g. Garri
5.	Ndi Ibe	Igbom.	Nkwo	Harvested dry Fish, garri, yam etc.
6.	Ndi Ibe.	Omkum.	Nkwo.	Agricultural products; e.g. Yam and Rice.
7.	Ndi Ibe.	Uzom Otom	Eke.	Agricultural products; Mainly Rice
8.	Ndi Ibe.	Ebiji Akara	Eke.	Manufactured products e.g. Garri

Table 11: Good Transported along Ndi- Ibe Water Ways. (Authors' Field work)

Plate 4: open passengers sitting area.
(Source: Author's field work).

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

Plate 5: Motorcycles parked at the point where the road terminates. (Source: Author's field work).

Fig 1: The highlighted portion of the map shows the proposed site for the terminal.

B. Case study Two: *Japan- Naoshima*
Designer: Sanaa/Kazuyo Sejima+ Ryue
Project Year: 2006.
Description

This ferry terminal consist of a large flat roof, a grid of thin columns with spacing of more than 4 metres, these columns are orderly arranged underneath the roof, the glass boxes under the roof are functional spaces for offices, shop and café. The simplicity and lightness of the design makes it easy for passengers and visitors to navigate, creating room for space and free circulation, the supporting columns seems to be too slender to be of any structural use and encourages more free space. The effect of these columns and the use of glass and mirrors as materials create a building which seems to invite the spectacular scenery of its location inside. Circulation seems very free within the building. Despite its openness it provides shelter for passengers departing or leaving the island.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

Materials: Concrete, Glass, Iron Columns.

Merits

1. Easy and free circulation which makes way finding easier.
2. Slender and less obvious columns that creates a building which does not hinder the views of passengers and visitors from enjoying the spectacular scenery.
3. Concrete is used for floor finish, considering heavy traffic; painting is used to change the texture in some area to differentiate activities and gives a different outlook.
4. Platform is raised to prevent water from encroaching when the area experiences higher tides.
5. Simplicity of design and availability of materials used makes for easy maintenance.
6. It serves the immediate needs of the local users.

Demerits

1. Walkways for pedestrians (passengers and visitors) and parking lots for vehicles can hardly be distinguished.
2. The over simplicity of the design does not make the building stand out as a landmark within the urban-scape.
3. With significant amount of rainfall throughout the year, the flat roof of the terminal makes for a difficult drainage.

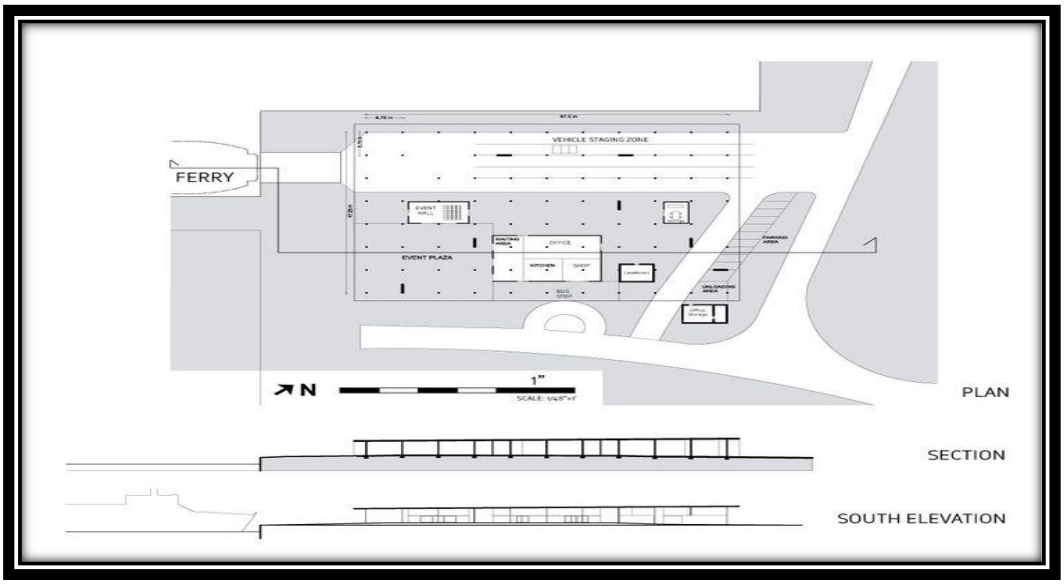

Fig 2: show the plan section and south Elevation of Naoshima Terminal

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

Plate 6: shows the slender and less obvious columns that do not impede passengers from viewing spectacular scenery.

Plate 7: shows the approach view of Naoshima terminal.

C.Design proposal for passengers and goods boat terminal Ndi-ibe water course, Afikpo-Ebonyi state

1. Location and Site Selection:

Proximity to the water body and accessibility were key factors in the selection of the location. The terminal is strategically located to serve the needs of both commuters and recreational users. The terminal integrated seamlessly with existing transport networks, while those in natural or recreational areas blended harmoniously with the environment.

2. Layout and Functionality:

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

The layout of a boat terminal was carefully planned using data collected from field work to ensure efficient operations. Key components of the design include:

- Docks and Berths: The terminal was provided with adequate docking facilities for different types of vessels, such as passenger ferries, private boats, and commercial boat. The layout also considered changes in tides, currents, and water depth.

- Passenger Areas: The Terminals featured a well-designed waiting area with comfortable seating, ticketing counters, information kiosks, and security checkpoints. The flow of passengers was carefully managed to prevent congestion.

- Vehicle Facilities: The design provided for vehicles designated spaces for parking and loading/unloading. Vehicle and pedestrian traffic was separated to ensure safety.

- Retail and Amenities: Terminals also housed retail spaces, restaurants, cafes, and other amenities to enhance the passenger experience.

3. Architecture and Aesthetics

- Visual Integration: The design harmonized with the surrounding landscape, with urban waterfront and natural coastline. This involved incorporating local architectural elements and the use of colors that blend with the environment.

- Iconic Elements: The design incorporated iconic features, such as unique canopies, sculptures, to create memorable landmarks.

4. Sustainability and Environmental Impact:

Sustainability is considered as a key aspect of this design. Boat terminals can have a significant impact on the environment, and thus, sustainable design practices are crucial. Key considerations include:

- Erosion Control: The Design considered the potential for erosion and incorporated measures to mitigate its effects, such as vegetation, and seawalls.

- Water Management: rainwater harvesting, and sustainable landscaping was incorporated to reduce the terminal's impact on the local ecosystem.

5. Accessibility and Inclusivity:

The Boat terminal is designed to be accessible to all users, including those with disabilities. This involves ramps, elevators, and tactile indicators for the visually impaired. Additionally, way finding signage was included to make it easy for all passengers to navigate the terminal.

6. Future Expansion and Flexibility:

The design allowed for future expansion and modifications as the needs of the terminal change over time. Scalability and flexibility in design can be cost-effective in the long run.

In conclusion, the architectural design of a boat terminal is a multidimensional process that requires a deep understanding of the terminal's purpose, location, and impact on its surroundings. A well-designed boat terminal not only serves as a functional transportation hub but also enriches the experience of users and contributes positively to the environment and local culture.

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Vol. 11, Issue 6, June 2024

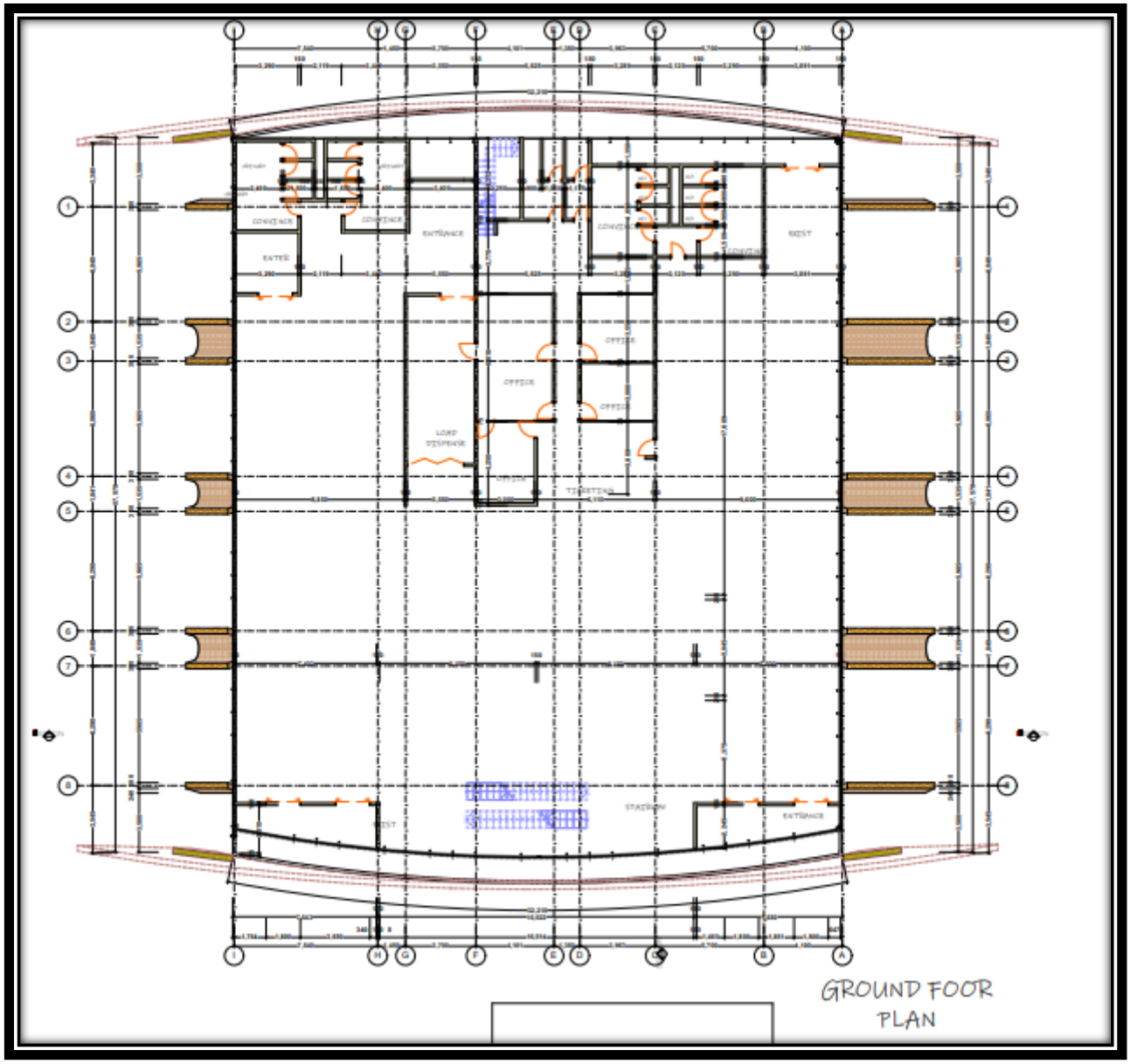

Fig 3: proposed floor plan for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

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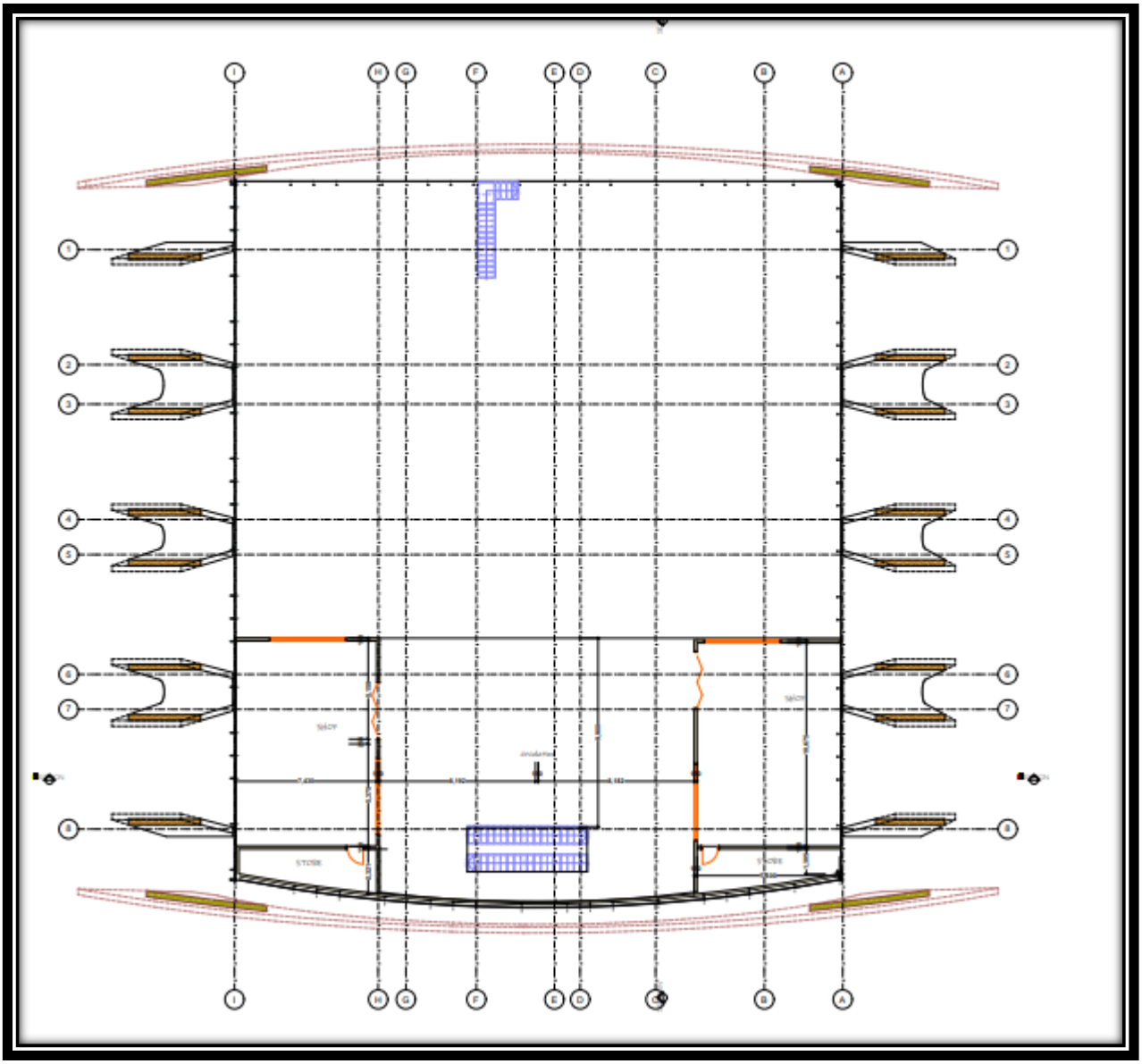

Fig 4: proposed first floor plan for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

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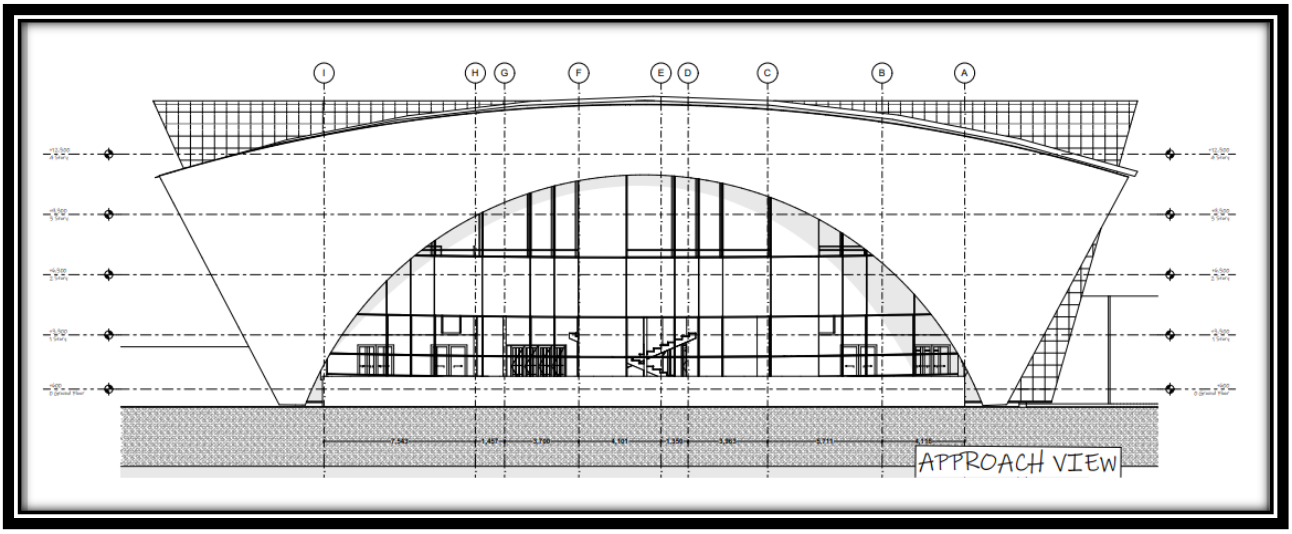

Fig 5: proposed front Elevation for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

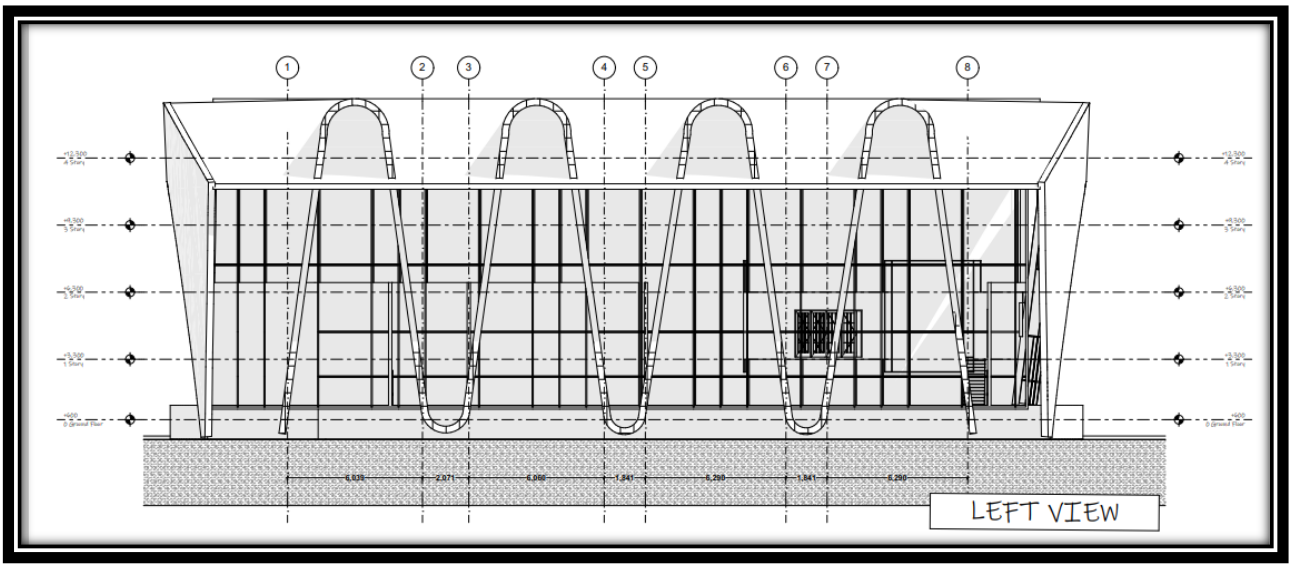

Fig 6: proposed left side Elevation for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

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Vol. 11, Issue 6, June 2024

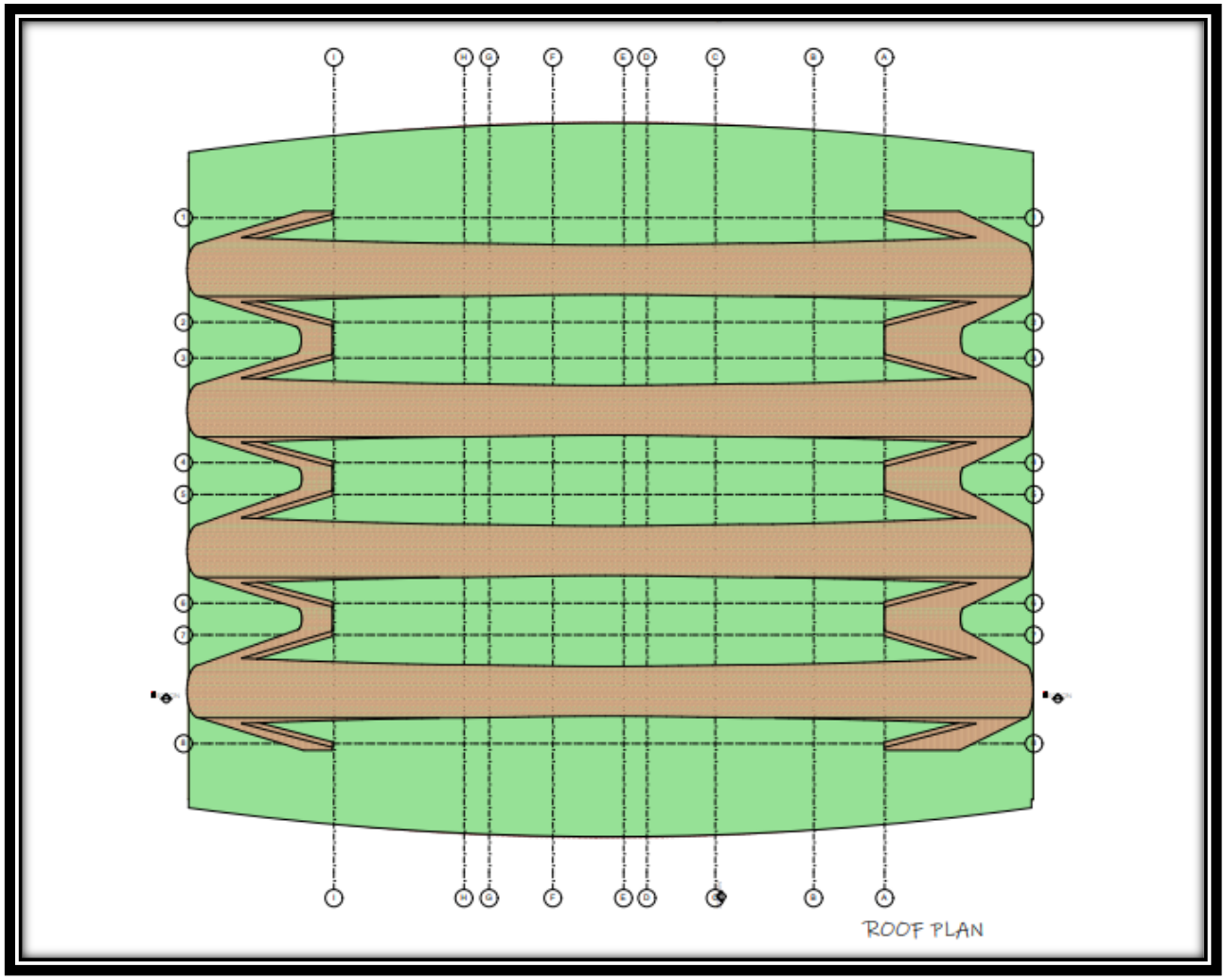

Fig 7: proposed roof Elevation for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

ISSN: 2350-0328
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Vol. 11, Issue 6, June 2024

Plate 8: 3D rendering of for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

Plate 9: 3D rendering of for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 6, June 2024

Plate 10: 3D rendering of for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

Plate 11: 3D rendering of for passengers and goods boat terminal **Ndi-ibe water course, Afikpo-Ebonyi state**

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Vol. 11, Issue 6, June 2024

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